

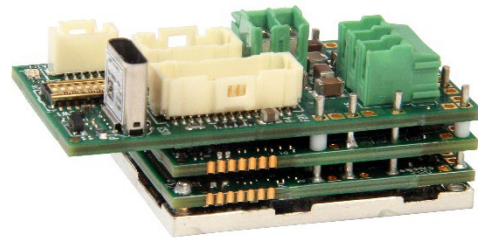
FXM060-10-CM

FlexPro® Series

Product Status: Active

SPECIFICATIONS

Current Peak	20 A
Current Continuous	10 A
DC Supply Voltage	10 – 55 VDC
Network Communication	CANopen



The **FXM060-10-CM** is an Extended Environment single-axis servo drive and integration board assembly for a FxE060-10-CM FlexPro® series servo drive with IMPACT™ architecture. Connections to the controller, motor, power, and feedback are simplified through the standard connectors featured on the board.

The **FXM060-10-CM** offers full tuning control of all servo loops and is designed to drive brushed and brushless servo motors, stepper motors, and AC induction motors. The drive accepts a variety of external command signals, or can use the built-in Motion Engine, an internal motion controller used with Sequencing and Indexing commands. Programmable digital and analog I/O are included to enhance interfacing with external controllers and devices.

The **FXM060-10-CM** utilizes CANopen network communication and is configured via USB. All drive and motor parameters are stored in non-volatile memory.

IMPACT™ (Integrated Motion Platform And Control Technology) combines exceptional processing capability and high-current components to create powerful, compact, feature-loaded servo solutions. IMPACT™ is used in all FlexPro® drives and is available in custom products as well.

The **FXM060-10-CM** conforms to the following specifications and is designed to the Environmental Engineering Considerations as defined in MIL-STD-810F.

EXTENDED ENVIRONMENT PERFORMANCE

Ambient Operating Temperature Range	-40°C to +95°C (-40°F to +203°F)
Thermal Shock	-40°C to +95°C (-40°F to +203°F) within 3 min.
Relative Humidity	0 to 95%, Non-Condensing
Vibration	25 Grms for 5 min. in 3 axes
Altitude	-400m to +25000m
Contaminants	Pollution Degree 2

FEATURES

- Follows the CAN in Automation (CiA) 301 Communications Profile and 402 Device Profile
- Four Quadrant Regenerative Operation
- Programmable Gain Settings
- PIDF Velocity Loop
- On-the-Fly Mode Switching
- On-the-Fly Gain Set Switching
- Dedicated Safe Torque Off (STO) Inputs
- Bridge Status, Fault and Network Status LEDs
- I/O Status LEDs
- Standard Connections for Easy Setup

Feedback Supported	<ul style="list-style-type: none"> • Absolute Encoder <ul style="list-style-type: none"> ◦ BiSS C-Mode ◦ EnDat 2.2 ◦ Tamagawa/Nikon ◦ SSI • Incremental Encoder • Hall Sensors • Tachometer (±10V) 	Motors Supported	<ul style="list-style-type: none"> • Three Phase • Single Phase • Stepper • AC Induction 	Modes of Operation	<ul style="list-style-type: none"> • Profile Modes • Cyclic Synchronous Modes • Current • Velocity • Position • Interpolated Position Mode (PVT)
Command Sources	<ul style="list-style-type: none"> • Over the Network • ±10V Analog • Sequencing • Indexing • Jogging • Step & Direction • Encoder Following 	Inputs / Outputs	<ul style="list-style-type: none"> • 4 Programmable Digital Inputs • 3 Programmable Digital Outputs • 1 Programmable Analog Input 	Agency Approvals	<ul style="list-style-type: none"> • RoHS • MIL-STD-810F (as stated) • MIL-STD-1275D (optional) • MIL-STD-461E (optional) • MIL-STD-704F (optional) • MIL-HDBK-217 (optional)

The diagram illustrates the internal architecture and external connections of the FXM060-10-CM drive. The central component is the **Drive Control Logic**, which is connected to various interfaces and connectors.

Left Side Connections:

- I/O Connector:** Provides inputs for PDI 1,2,3,4, GND, PDI 0,1,2,3, PAI+, and PAI-. It connects to an **I/O Interface** block.
- Feedback:** Receives STEP/DIR+ and STEP/DIR- signals, passing them through a buffer to a **STEP/DIR Input** block.
- USB Connector:** Provides USB +V, DATA+, DATA-, and USB GND connections to a **USB Interface** block.
- CANopen Connector:** Provides CAN_H and CAN_L connections to a **CAN Transceiver**, which then connects to a **CANopen Interface** block.

Right Side Connections:

- Feedback Connector:** Provides feedback signals including ENC 1+, ENC 1-, ENC 2+, ENC 2-, HALL A,B,C, MOTOR THERMISTOR, and GND. It connects to a **Feedback Interface** block.
- Power Connector:** Provides connections for STO 1, STO 2, STO 2 Return, MOTOR A, MOTOR B, MOTOR C, HIGH VOLTAGE, and GND. It connects to a **Power Supply Line** block.
- Logic Connector:** Provides LOGIC POWER and LOGIC GND connections to a **Logic Supply Line** block.

Internal Components and Connections:

- The **Drive Control Logic** is the central hub, connected to the **I/O Interface**, **STEP/DIR Input**, **Feedback Interface**, **Power Supply Line**, **Logic Supply Line**, **USB Interface**, and **CANopen Interface**.
- The **Power Supply Line** block includes **STO Circuitry** and is connected to the **Power Connector** and **Logic Supply Line**.
- The **Logic Supply Line** block provides power to the **Drive Control Logic** and other logic components.
- Various passive components like resistors (e.g., 39Ω, 10k, 5k, 120k, 100pF) and capacitors are shown for signal conditioning and timing.

Labels:

- Drive:** The main functional block containing the Drive Control Logic and its associated interfaces.
- FXM060-10-CM:** The model name of the drive.

**RoHS
Compliant**

The RoHS Directive restricts the use of certain substances including lead, mercury, cadmium, hexavalent chromium and halogenated flame retardants PBB and PBDE in electronic equipment.

Characteristics of 28 Volt DC Electrical Systems in Military Vehicles – (optional)

Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment – (optional)

Aircraft Electric Power Characteristics – (optional)

Reliability Prediction of Electronic Equipment (MTBF) – (optional)

SPECIFICATIONS

Description		Electrical Specifications	
		Units	Value
Nominal DC Supply Input Range		VDC	12 – 48
DC Supply Input Range		VDC	10 – 55
DC Supply Undervoltage		VDC	8
DC Supply Overvoltage		VDC	58
Logic Supply Input Range (optional)		VDC	10 – 55
Safe Torque Off Voltage (Default)		VDC	5
Maximum Peak Current Output ¹		A (Arms)	20 (14.1)
Maximum Continuous Current Output ²		A (Arms)	10 (10)
Bus Capacitance ³		μF	52.8
Efficiency at Rated Power		%	99
Maximum Continuous Output Power		W	545
Maximum Power Dissipation at Continuous Current		W	6
Minimum Load Inductance (line-to-line) ⁴		μH	150 (@ 48VDC supply); 75 (@24VDC supply); 40 (@12VDC supply)
Switching Frequency		kHz	20
Maximum Output PWM Duty Cycle		%	83
Description		Control Specifications	
		Units	Value
Communication Interfaces		-	CANopen (USB for configuration)
Command Sources		-	±10 V Analog, Over the Network, Sequencing, Indexing, Jogging, Step & Direction, Encoder Following
Feedback Supported		-	Absolute Encoder (BiSS C-Mode, EnDat 2.2, Tamagawa/Nikon, SSI), Incremental Encoder, Hall Sensors, Auxiliary Incremental Encoder, Tachometer (±10V)
Commutation Methods		-	Sinusoidal, Trapezoidal
Modes of Operation		-	Profile Modes, Cyclic Synchronous Modes, Current, Velocity, Position, Interpolated Position Mode (PVT)
Motors Supported ⁵		-	Three Phase (Brushless Servo), Single Phase (Brushed Servo, Voice Coil, Inductive Load), Stepper (2- or 3-Phase Closed Loop), AC Induction (Closed Loop Vector)
Hardware Protection		-	40+ Configurable Functions, Over Current, Over Temperature (Drive & Motor), Over Voltage, Short Circuit (Phase-Phase & Phase-Ground), Under Voltage
Programmable Digital Inputs/Outputs		-	4/3
Programmable Analog Inputs/Outputs		-	1/0
Primary I/O Logic Level		-	5 VDC, not isolated
Current Loop Sample Time		μs	50
Velocity Loop Sample Time		μs	100
Position Loop Sample Time		μs	100
Maximum Encoder Frequency		MHz	20 (5 pre-quadrature)
Description		Mechanical Specifications	
		Units	Value
Size (H x W x D)		mm (in)	50.8 x 25.4 x 22.0 (2.00 x 1.00 x 0.86)
Weight		g (oz)	34 (1.2)
Ambient Operating Temperature Range ⁶		°C (°F)	-40 – 95 (-40 – 203)
Storage Temperature Range		°C (°F)	-50 – 100 (-58 – 212)
Thermal Shock		°C (°F)	-40 – 95 (-40 – 203) within 3 min
Relative Humidity		-	0-95%, non-condensing
Vibration		Grms	25 for 5 minutes in 3 axes
Altitude		m	-400 – 25000
Contaminants		-	Pollution Degree 2
P1 CANopen COMMUNICATION CONNECTOR		-	6-pin, 1.0mm spaced single row vertical header
P2 USB CONNECTOR		-	USB Type C, vertical entry
P3 IO and LOGIC CONNECTOR		-	20-pin, 1.0mm spaced dual row vertical header
P4 FEEDBACK CONNECTOR		-	30-pin, 1.0mm spaced dual row vertical header
P5 POWER CONNECTOR		-	2-port, 3.5mm spaced vertical entry screw terminal
P6 MOTOR POWER CONNECTOR		-	3-port, 3.5mm spaced vertical entry screw terminal

Notes

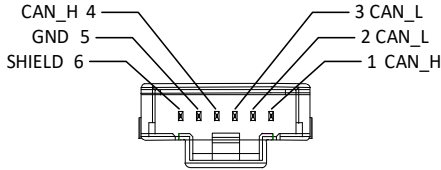
- Capable of supplying drive rated peak current for 2 seconds with 5 second foldback to continuous value. Longer times are possible with lower current limits.
- Continuous A_{rms} value attainable when RMS Charge-Based Limiting is used.
- Applications with a supply voltage higher than 30VDC require a minimum external decoupling capacitance of 470μF / 100V added across HV and POWER GND.
- Lower inductance is acceptable for bus voltages well below maximum. Use external inductance to meet requirements.
- Maximum motor speed for stepper motors is 600 RPM. Consult the hardware installation manual for 2-phase stepper wiring configuration.
- Additional cooling and/or heatsink may be required to achieve rated performance.

PIN FUNCTIONS

P1 – CANopen Communication Connector

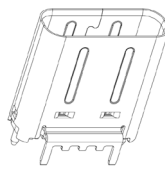
Pin	Name	Description / Notes	I/O
1	CAN_H	CAN_H bus line (dominant high)	I/O
2	CAN_L	CAN_L bus line (dominant low)	I/O
3	CAN_L	CAN_L bus line (dominant low)	I/O
4	CAN_H	CAN_H bus line (dominant high)	I/O
5	GND	Ground	GND
6	SHIELD	CAN shield	-

Connector Information	6-pin, 1.0mm spaced single row vertical header
Mating Connector Details	Molex: 5013300600
Mating Connector Included	No



P2 – USB Connector

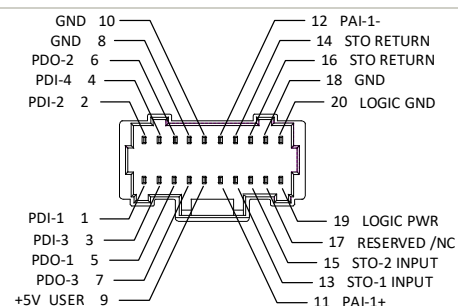
Pin	Name	Description / Notes	I/O
Connector Information	USB Type C port		
Mating Connector Details	Standard Type C USB connection cable		
Mating Connector Included	No		



P3 – I/O and Logic Connector

Pin	Name	Description / Notes	I/O
1	PDI-1	General Purpose Programmable Digital Input	I
2	PDI-2	General Purpose Programmable Digital Input	I
3	PDI-3	General Purpose Programmable Digital Input	I
4	PDI-4	General Purpose Programmable Digital Input	I
5	PDO-1	General Purpose Programmable Digital Output (TTL/8mA)	O
6	PDO-2	General Purpose Programmable Digital Output (TTL/8mA)	O
7	PDO-3	General Purpose Programmable Digital Output (TTL/8mA)	O
8	GND	Ground.	GND
9	+5V_USER	+5V Supply Output. Short-circuit protected. (300ma total load capacity shared between P3-9, P4-1, P4-13, and P4-21)	O
10	GND	Ground.	GND
11	PAI-1+	General Purpose Differential Programmable Analog Input or Reference Signal Input.	I
12	PAI-1-	±10VDC Range (12-bit Resolution)	I
13	STO-1 INPUT	Safe Torque Off – Input 1	I
14	STO RETURN	Safe Torque Off Return	STORET
15	STO-2 INPUT	Safe Torque Off – Input 2	I
16	STO RETURN	Safe Torque Off Return	STORET
17	RESERVED / NC	Reserved.	-
18	GND	Ground.	GND
19	LOGIC PWR	Logic Supply Input (10 – 55VDC) (optional)	I
20	LOGIC GND	Ground	GND

Connector Information	20-pin, 1.0mm spaced dual row vertical header
Mating Connector Details	Molex: 501892010
Mating Connector Included	No



P4 – Feedback Connector

Pin	Absolute Encoder	Incremental Encoder	Description / Notes	I/O
1	+5V_USER	+5V_USER	+5V Supply Output. Short-circuit protected. (300ma total load capacity shared between P3-9, P4-1, P4-13, and P4-21)	O
2	GND	GND	Ground.	GND
3	HALL A	HALL A	Single-ended Commutation Sensor Inputs.	I
4	HALL B	HALL B		I
5	HALL C	HALL C		I
6	THERMISTOR	THERMISTOR	Motor Thermal Protection.	I
7	ENC 2 A+	ENC 2 A+	Differential Incremental Encoder A.	I
8	ENC 2 A-	ENC 2 A-		I
9	ENC 2 B+	ENC 2 B+	Differential Incremental Encoder B.	I
10	ENC 2 B-	ENC 2 B-		I
11	ENC 2 I+	ENC 2 I+	Differential Incremental Encoder Index.	I
12	ENC 2 I-	ENC 2 I-		I
13	+5V_USER	+5V_USER	+5V Supply Output. Short-circuit protected. (300ma total load capacity shared between P3-9, P4-1, P4-13, and P4-21)	O
14	GND	GND	Ground.	GND
15	STEP +	STEP +	Differential Step Input.	I
16	STEP -	STEP -		I
17	DIR +	DIR +	Differential Direction Input.	I
18	DIR -	DIR -		I
19	RESERVED	RESERVED	Reserved.	-
20	RESERVED	RESERVED		-
21	+5V_USER	+5V_USER	+5V Supply Output. Short-circuit protected. (300ma total load capacity shared between P3-9, P4-1, P4-13, and P4-21)	O
22	GND	GND	Ground.	GND
23	ENC 1 DATA+	ENC 1 A+	Differential Data Line for Absolute Encoders (BiSS: SLO+/-) or Differential Incremental Encoder A.	I
24	ENC 1 DATA-	ENC 1 A-		I
25	ENC 1 CLOCK+	ENC 1 B+	Differential Clock Line for Absolute Encoders (BiSS: MA+/-) or Differential Incremental Encoder B.	I
26	ENC 1 CLOCK-	ENC 1 B-		I
27	ENC 1 REF MARK+	ENC 1 I+	Differential Reference Mark for Absolute Encoders (Leave open for BiSS and EnDat 2.2) or Differential Incremental Encoder Index.	I
28	ENC 1 REF MARK-	ENC 1 I-		I
29	RESERVED	RESERVED	Reserved.	-
30	RESERVED	RESERVED	Reserved.	-

Connector Information

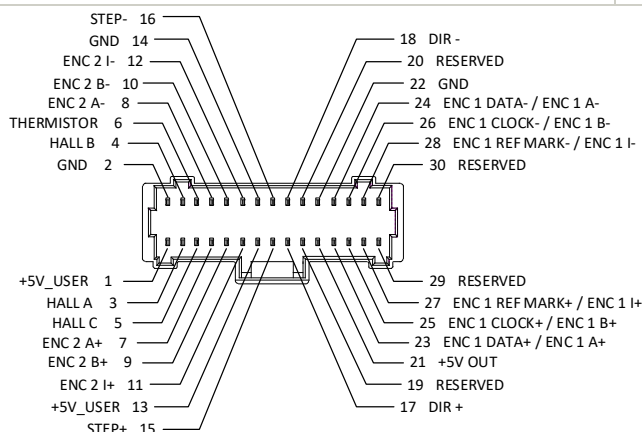
30-pin, 1.0mm spaced dual row vertical header

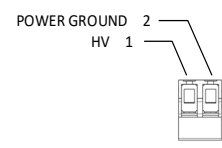
Mating Connector Details

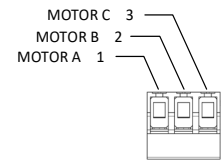
Molex: 5011893010

Mating Connector Included

No



P5 - Power Connector			
Pin	Name	Description / Notes	I/O
1	HV	DC Supply Input. Applications with a supply voltage higher than 30VDC require a minimum external decoupling capacitance of 470 μ F / 100V added across HV and POWER GND.	I
2	POWER GND	Ground.	GND
Connector Information		2-port 3.5mm spaced vertical entry screw terminal	
Mating Connector Details		N/A	
Mating Connector Included		N/A	

P6 – Motor Power Connector			
Pin	Name	Description / Notes	I/O
1	MOTOR A	Motor Phase A.	O
2	MOTOR B	Motor Phase B.	O
3	MOTOR C	Motor Phase C.	O
Connector Information		3-port 3.5mm spaced vertical entry screw terminal	
Mating Connector Details		N/A	
Mating Connector Included		N/A	

BOARD CONFIGURATION

Status LED Functions

LED	Description
STAT	Indicates drive power bridge status. GREEN when DC bus power is applied and the drive is enabled. RED when the drive is in a fault state.
LOGIC PWR	Indicates that +5V logic power is available to the drive. GREEN when +5V logic power is available.

Switch Settings

The CANopen Node ID and baud rate are set using DIP Switch SW1. Switch settings are given in the below table.

SW1	Description	On	Off
1	Bit 0 of binary CANopen ID.	On = 1, Off = 0. Note that setting all addressing switches to 0 will use the address stored in NVM. Default setting is NVM address.	
2	Bit 1 of binary CANopen ID.		
3	Bit 2 of binary CANopen ID.		
4	Bit 3 of binary CANopen ID.		
5	Baud Rate	500k	Set via software (default)
6	RESERVED	Invalid	Leave off for proper operation
7	RESERVED	Invalid	
8	Network Termination	Terminated	Not Terminated (default)

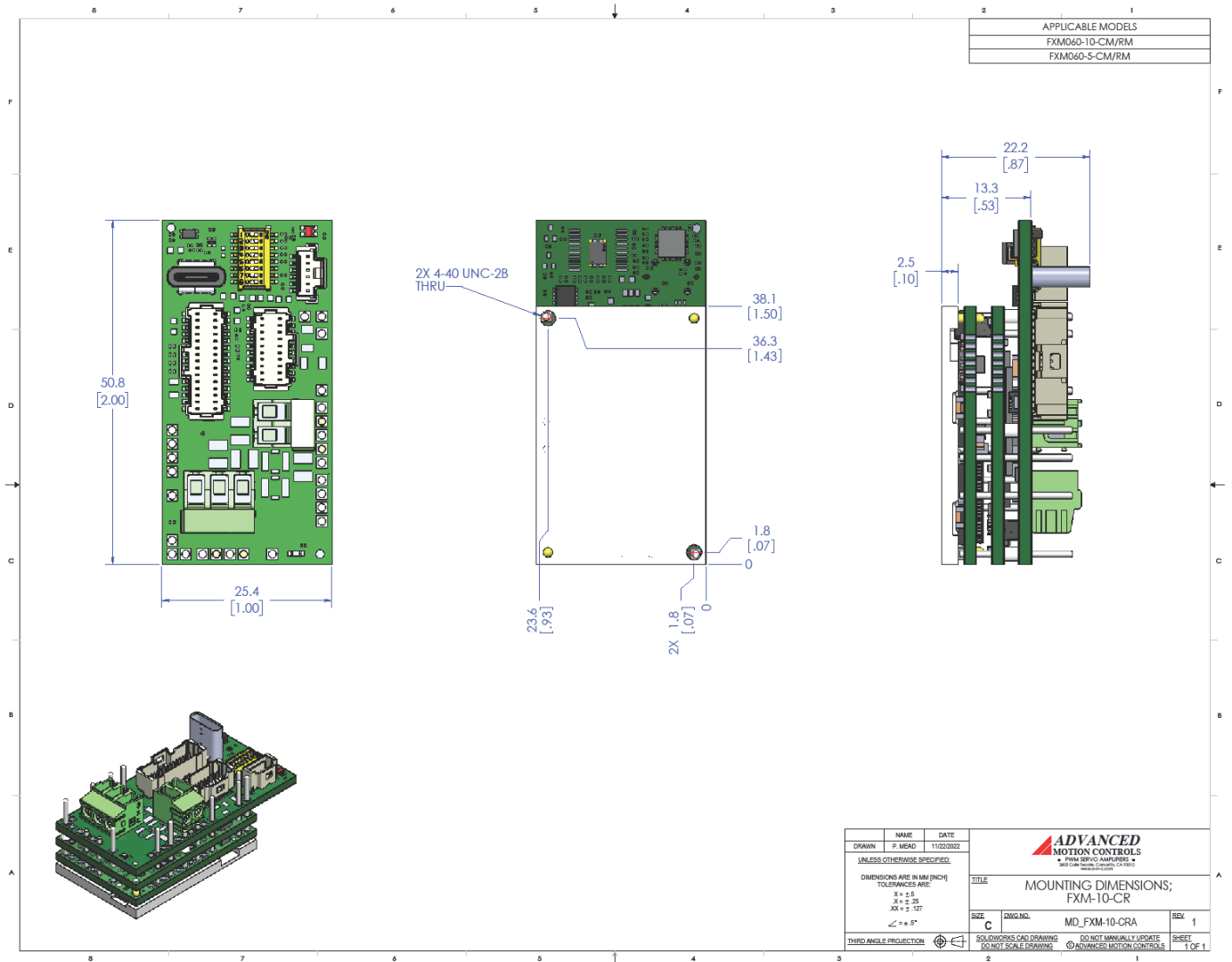
Safe Torque Off (STO) Inputs

The Safe Torque Off (STO) inputs are dedicated +5VDC sinking single-ended inputs. For applications not using STO functionality, disabling of the STO feature is required for proper drive operation. STO may be disabled by following the STO Disable wiring instructions as given in the hardware installation manual.

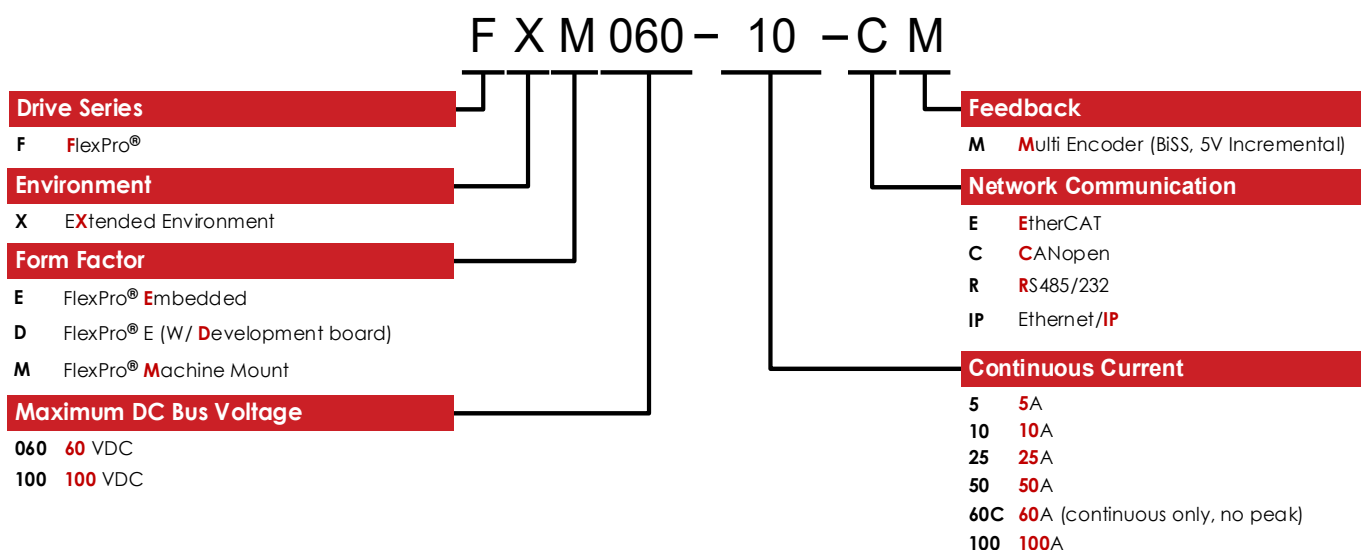
Mating Connector Kit

Mating connector housing and crimp contacts can be ordered as a kit using ADVANCED Motion Controls' part number KC-MC1XFMCR01. This includes mating connector housing and crimp style contacts for the Communication, I/O and Logic, and Feedback connectors. The recommended tool for crimping the contacts is Molex PN: 63819-1500 (not included with the kit). Pre-crimped leads (Molex PN: 797581018) are also available for purchase from many inline component vendors.

MOUNTING DIMENSIONS



PART NUMBERING AND CUSTOMIZATION INFORMATION



ADVANCED Motion Controls also has the capability to promptly develop and deliver specified products for OEMs with volume requests. Our Applications and Engineering Departments will work closely with your design team through all stages of development in order to provide the best servo drive solution for your system. Equipped with on-site manufacturing for quick-turn customs capabilities, ADVANCED Motion Controls utilizes our years of engineering and manufacturing expertise to decrease your costs and time-to-market while increasing system quality and reliability.

Examples of Customized Products

- | | |
|--------------------------------|-----------------------------------|
| ▲ Optimized Footprint | ▲ Tailored Project File |
| ▲ Private Label Software | ▲ Silkscreen Branding |
| ▲ OEM Specified Connectors | ▲ Optimized Base Plate |
| ▲ No Outer Case | ▲ Increased Current Limits |
| ▲ Increased Current Resolution | ▲ Increased Voltage Range |
| ▲ Increased Temperature Range | ▲ Conformal Coating |
| ▲ Custom Control Interface | ▲ Multi-Axis Configurations |
| ▲ Integrated System I/O | ▲ Reduced Profile Size and Weight |

Feel free to contact us for further information and details!

Available Accessories

ADVANCED Motion Controls offers a variety of accessories designed to facilitate drive integration into a servo system. Visit www.a-m-c.com to see which accessories will assist with your application design and implementation.

All specifications in this document are subject to change without written notice. Actual product may differ from pictures provided in this document.